COMPREHENSIVE DICTIONARY OF ELECTRICAL ENGINEERING

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G

G (giga) a prefix indicating a quantity of 10^9. For instance, a gigabyte (GB) of storage is 1,000,000,000 (typically implemented as 2^30) bytes.

G_{CR} common notation for compression. *See* compression.

g_d common notation for DC drain conductance.

G_I common notation for current gain. G_I is dimensionless.

g_m common notation for DC transconductance.

G_P common notation for power gain in decibels.

G_T common notation for transducer gain in amperes/volt.

G_V common notation for voltage gain. G_V is dimensionless.

G-line a line of the mercury spectrum corresponding to a wavelength of about 436 nm.

GaAlSb/InGaAlAsSb nearly lattice matched semiconductor heterostructure system capable of "staggered" band lineups in which the electrons and holes congregate in separate layers. Unique transport properties are utilized in optical devices and tunnel structures.

GaAs periodic table symbol for gallium arsenide. *See* gallium arsenide.

GaAs laser a semiconductor laser for wavelengths in the near infrared. The active medium is a gallium-arsenide semiconductor alloy.

GaAs/AlGaAs most commonly grown semiconductor epitaxial heterostructure due to its lattice match, common anion, and existing technology base of GaAs devices.

gain (1) the ratio of the output variable of a device to its input variable. For calculation purposes, the dimensionality of the gain is simply the unit of the output variable divided by the unit of the input variable. The gain of a device is a dimensionless value only when the electrical units of both the input and output variables are the same (e.g., voltage gain, current gain, power gain, etc.). In this case, a gain greater than one indicates an increase from input to output, while a value for gain less than one is indicative of a decrease (or attenuation). The overall gain of several cascaded components is found by multiplying the individual gains of each component in the system. Gain is often expressed in decibels to facilitate calculation of cascaded gains in a system. *See also* decibel.

(2) the ratio of the radiation intensity of a particular antenna to that of an isotropic radiator, in the same direction and at the same distance.

gain circles circles of constant gain plotted on the Smith chart that can be used to graphically impedance match a device to achieve a desired gain. The circles are generated by plotting on the Smith chart the solution for the source reflection coefficient, Γ_s, or load reflection coefficient, Γ_L, in the transducer gain equation for a fixed value of

$$G = \frac{|S_{21}|^2 \left(1 - |\Gamma_S|^2\right)\left(1 - |\Gamma_L|^2\right)}{|\left(1 - S_{11}\Gamma_S\right)\left(1 - S_{22}\Gamma_L\right) - S_{12}S_{21}\Gamma_L\Gamma_S|^2}$$

for a fixed value of G_t, where S_{11}, S_{22}, S_{12}, and S_{21} are the scattering parameters for the device.

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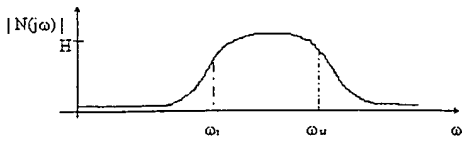

Band-pass filter response.

is very small and there is practically no transmission of the signal.

band-pass network a configuration of solely passive components or combination of active and passive components that will attenuate all signals outside of the desired range of frequency.

band-pass signal a signal whose Fourier transform or spectrum approaches zero outside a given frequency band. Ideally, the spectrum should equal zero outside the band, but this is difficult to achieve in practice. This may be described mathematically as follows: let $X(\omega)$ be the Fourier transform of the signal. Then, for a band-pass signal we have $X(\omega) = 0$ for $|\omega| \notin [\omega_1, \omega_2]$, for some $0 < \omega_1 < \omega_2$.

bandgap energy in materials with band energy levels, the minimum energy needed to excite a charge carrier from a lower to an upper band. *See also* absorption edge.

bandgap engineering in materials such as compound semiconductors and superlattice structures, the fabrication of materials with specific bandgap energies by varying the fractional proportions of the constituents and by varying superlattice layer thicknesses.

bandgap narrowing reduction of the forbidden energy gap of a semiconducting material due to the narrowing influence of impurities.

bandgap reference a voltage reference based on the 1.205 V bandgap voltage of silicon.

bandgap wavelength the optical wavelength corresponding to a photon energy equal to the bandgap energy.

bandlimited a waveform is described as bandlimited if the frequency content of the signal is constrained to lie within a finite band of frequencies. This band is often described by an upper limit, the Nyquist frequency, assuming frequencies from DC up to his upper limit may be present. This concept can be extended to frequency bands that do not include DC.

bandwidth (1) the frequency range of a message or information processing system measured in hertz.

(2) width of the spectral region over which an amplifier (or absorber) has substantial gain (or loss); sometimes represented more specifically as, for example, full width at half maximum.

(3) the property of a control system or component describing the limits of sinusoidal input frequencies to which the system/component will respond. It is usually measured at the half-power points, which are the upper and lower frequencies at which the output power is reduced by one half. Bandwidth is one measure of the frequency response of a system, i.e., the manner in which it performs when sine waves are applied to the input.

(4) the lowest frequency at which the ratio of the output power to the input power of an optical fiber transmission system decreases by one half (3 dB) compared to the ratio measured at approximately zero modulation frequency of the input optical power source. Since signal distortion in an optical fiber increases with distance in an optical fiber, the bandwidth is also a function of length and is usually given as the bandwidth-distance product for the optical fiber in megahertz per kilometer. *See also* signal distortion and bandwidth-distance product.

bandwidth efficiency the ratio of the information rate in bits per second to the required band-

SIT *See* static induction transistor.

site diversity the combination of received signals at widely separated locations having substantially different propagation paths to the transmitter. The resultant signal has reduced fading depth and therefore higher quality communication is possible. Often used in Earth–satellite link to overcome the effects of scintillation and rain fading. *See also* space diversity.

SITH *See* static induction thyristor.

skeleton the set of arcs, enclosing a region, resulting from the successive application of a thinning operator on the region.

skeletonization a procedure, usually thinning, that produces an image skeleton.

skew (1) an arrangement of slots or conductors in squirrel cage rotors so that they are not parallel to the rotor axis.

(2) in computer buses, a condition where values on certain bus lines have slightly different transmission times than values on other lines of the same bus. *See also* tape skew.

skewed addressing *See* interleaved memory.

skewed symmetry the nonperpendicular appearance of a symmetry-axes system for an object, when the plane of the object is not perpendicular to the line of sight from the viewpoint.

skewing (1) the bending of a curve away from it's original shape.

(2) In a differential amplifier, the offset between two signals.

skin depth for a lossy material, the distance at which electromagnetic fields experience one neper of attenuation. For a good conductor, the skin depth is given by

$$\frac{1}{\sqrt{\pi \mu f \sigma}}$$

where f is the frequency, μ is the permeability, and σ is the conductivity.

skin effect the tendency of an alternating current to concentrate in the areas of lowest impedance.

skinny minnie a telescoping fiberglass pole with interchangeable tools mounted at its end. It can be extended sufficiently to allow a line worker to service cut-outs and similar pole-top equipment from the ground.

skip instruction an assembly language instruction that skips over the next instruction without executing it.

sky wave a wave that propagates into the ionosphere. It undergoes several reflections and refractions before it returns back to Earth.

slab waveguide a dielectric waveguide useful for theoretical studies and for approximating other types of waveguide such as the rib waveguide. *See* rib waveguide.

slant angle also called "dip angle"; the angle by which a plane slants or dips away from the frontal plane of the observer.

sleeve (1) rubber cover for a line worker's arms.

(2) a type of wire connector.

slew rate the rate of variation of an AC voltage in terms of volts per second.

In an op-amp, if the signal at the op-amp output attempts to exceed this limit, the op-amp cannot follow and distortion ("slew rate limiting") will result.